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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/788,339	02/21/2001	Sadaji Tsuge	P107336-00018	1063

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EXAMINER
MUTSCHLER, BRIAN L

ART UNIT	PAPER NUMBER
1753	14

DATE MAILED: 02/20/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

AS-14

Office Action Summary	Application No.	Applicant(s)	
	09/788,339	TSUGE, SADAJI	
	Examiner	Art Unit	
	Brian L. Mutschler	1753	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *16 January 2003* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-8* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-8* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *16 December 2002* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other:

DETAILED ACTION

Comments

1. The objection to the specification has been overcome by Applicant's amendment.

2. The rejection of claims 1 and 2 under 35 U.S.C. 112, second paragraph, has been overcome by Applicant's amendment.

Drawings

3. The corrected or substitute drawings were received on December 16, 2002. These drawings are approved.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 1-5, 7 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hanoka et al. (U.S. Pat. No. 6,353,042) in view of Yamagishi et al. (U.S. Pat. No. 6,300,556) and in view of Asano et al. (U.S. Pat. No. 5,456,764).

Hanoka et al. disclose a solar cell module having a plurality of solar cells **22** encapsulated within a sealing material **10** (fig. 2). A front surface light transmitting member **26** is made of glass, and a rear surface member **28** is made of glass or a resin, such as Tedlar™, a transparent film (col. 5, line 65 to col. 6, line 9). A transparent film

would allow light to enter from both sides of the solar cell. The solar cells **22** may comprise crystalline or amorphous material and may be made of silicon or one of several other semiconductor materials (col. 1, lines 31-35; col. 6, lines 19-59). Hanoka et al. specifically disclose a module as shown in figure 2, "a solar cell module **20** in which the encapsulant material **10** encapsulates interconnected crystalline silicon solar cells **22**" (col. 5, lines 55-57). Hanoka et al. is silent on the details of the junction within the crystalline silicon solar cells **22**.

The solar cell module disclosed by Hanoka et al. differs from the instant invention because Hanoka et al. do not disclose the following:

a. The front surface member containing sodium, as recited in claim 1;

b. The solar cell having a p- or n-type crystalline silicon substrate and an n- or p-type semiconductor layer formed on the substrate, as recited in claim 1;

c. The crystalline substrate is positioned on a side of the front surface side light transmitting member and the semiconductor layer is positioned on a side of the rear surface side member, as recited in claim 1; and

d. The solar cell element includes a heterojunction between a crystalline semiconductor and an amorphous semiconductor, as recited in claim 8.

Regarding claim 1, Yamagishi et al. disclose the use of soda lime glass, which contains sodium, as a surface member (col. 7, line 29). Soda lime glass is a conventional glass used in solar cell modules because it is inexpensive.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the solar cell module of Hanoka et al. to use soda lime glass as the front surface member, as taught by Yamagishi et al., because soda lime glass is very inexpensive and provides excellent weather resistance.

Regarding claims 1 and 8, Asano et al. disclose a solar cell having a p-type crystalline substrate **11** and an n-type amorphous silicon layer **2** forming a heterojunction (fig. 4 and 5; col. 4, line 55 to col. 5, line 25). As shown in Figures 4 and 5, the substrate **11** can be formed on either side of the photovoltaic element, i.e., the side receiving sunlight of the side opposite the sunlight-receiving side. Furthermore, the embodiment shown in Figure 5 is capable of receiving light from either side through the use of a grid electrode **31** and a transparent electrode **4**. Regarding the use of the term substrate, the crystalline layer disclosed by Asano et al. is referred to as a substrate in several embodiments and can function as a substrate because it is capable of supporting the amorphous layer formed on the crystalline layer.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the solar cell module of Hanoka et al. to use a crystalline silicon substrate and an amorphous layer forming a heterojunction, as taught by Asano et al., because using a crystalline silicon substrate would provide structural support for the solar cell while increasing the photoelectric conversion efficiency through the use of crystalline material, and the formation of an amorphous layer on the substrate

would simplify the construction of the solar cell because amorphous silicon is easier and less expensive to manufacture than crystalline silicon.

6. Claims 1-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hanoka et al. (U.S. Pat. No. 6,353,042) in view of Yamagishi et al. (U.S. Pat. No. 6,300,556), in view of Nakagawa et al. (U.S. Pat. No. 5,858,120) and in view of Asano et al. (U.S. Pat. No. 5,456,764).

Hanoka et al. disclose a solar cell module having a plurality of solar cells **22** encapsulated within a sealing material **10** (fig. 2). A front surface light transmitting member **26** is made of glass, and a rear surface member **28** is made of glass or a resin, such as Tedlar™, a transparent film (col. 5, line 65 to col. 6, line 9). A transparent film would allow light to enter from both sides of the solar cell. The solar cells **22** may comprise crystalline or amorphous material and may be made of silicon or one of several other semiconductor materials (col. 1, lines 31-35; col. 6, lines 19-59). Hanoka et al. specifically disclose a module as shown in figure 2, "a solar cell module **20** in which the encapsulant material **10** encapsulates interconnected crystalline silicon solar cells **22**" (col. 5, lines 55-57). Hanoka et al. is silent on the details of the junction within the crystalline silicon solar cells **22**.

The solar cell module disclosed by Hanoka et al. differs from the instant invention because Hanoka et al. do not disclose the following:

a. The front surface member containing sodium, as recited in claim 1;

b. The solar cell having a p- or n-type crystalline silicon substrate and an n- or p-type semiconductor layer formed on the substrate, as recited in claim 1;

c. The crystalline substrate is positioned on a side of the front surface side light transmitting member and the semiconductor layer is positioned on a side of the rear surface side member, as recited in claim 1; and

d. The solar cell element is a single crystalline silicon solar cell element formed by doping impurities in the p-type or n-type substrate, as recited in claim 6.

Regarding claim 1, Yamagishi et al. disclose the use of soda lime glass, which contains sodium, as a surface member (col. 7, line 29). Soda lime glass is a conventional glass used in solar cell modules because it is inexpensive.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the solar cell module of Hanoka et al. to use soda lime glass as the front surface member, as taught by Yamagishi et al., because soda lime glass is very inexpensive and provides excellent weather resistance.

Regarding claim 1, Asano et al. disclose a solar cell having a p-type crystalline substrate **11** and an n-type amorphous silicon layer **2** forming a heterojunction (fig. 4 and 5; col. 4, line 55 to col. 5, line 25). As shown in Figures 4 and 5, the substrate **11** can be formed on either side of the photovoltaic element, i.e., the side receiving sunlight

of the side opposite the sunlight-receiving side. Furthermore, the embodiment shown in Figure 5 is capable of receiving light from either side through the use of a grid electrode **31** and a transparent electrode **4**. Regarding the use of the term substrate, the crystalline layer disclosed by Asano et al. is referred to as a substrate in several embodiments and can function as a substrate because it is capable of supporting the amorphous layer formed on the crystalline layer.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the solar cell module of Hanoka et al. to use a solar cell capable of receiving light from either side, as taught by Asano et al., because using a solar cell capable of receiving light from either side would increase the amount of light incident on the solar cell, increasing the conversion efficiency.

Regarding claim 6, Nakagawa et al. disclose a method for forming a crystalline solar cell element, wherein a single crystalline silicon wafer, which is p-type, is doped by heat diffusion to create an n-type layer on the single crystalline substrate (col. 13, lines 36-46). Single crystalline silicon has a higher conversion efficiency than amorphous or polycrystalline silicon.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the crystalline silicon solar cell in the device of Hanoka et al. to use a single crystalline silicon substrate that is doped by heat diffusion, as taught by Nakagawa et al. because single crystalline has a high conversion efficiency.

7. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hanoka et al. (U.S. Pat. No. 6,353,042) in view of Yamagishi et al. (U.S. Pat. No. 6,300,556) and in view of Asano et al. (U.S. Pat. No. 5,456,764), as applied above to claims 1-5, 7 and 8, and further in view of Matsushita et al. (U.S. Pat. No. 6,222,118).

Hanoka et al., Yamagishi et al. and Asano et al. describe a solar cell module having the limitations of claims 1-5, 7 and 8 of the instant invention, as explained above in section 5. However, they do not disclose the use of single crystalline silicon solar cell elements as claimed in the instant invention.

Matsushita et al. teach the use of single crystalline silicon solar cell elements (col. 4, line 53). Matsushita et al. also teach that polycrystalline silicon, amorphous silicon, or combinations of both can equally be used in solar cell elements (col. 8, line 63).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have made the solar cell modules described by Hanoka et al., Yamagishi et al. and Asano et al. to use a single crystalline silicon layer because single crystalline layers, amorphous layers and polycrystalline layers are equally usable in solar cell modules, as taught by Matsushita et al. (col. 8, line 63).

Response to Arguments

8. Applicant's arguments filed December 16, 2002, have been fully considered but they are not persuasive.

9. Regarding the claims in the instant specification, it is noted that the solar cell module as claimed is using known solar cells in a known module. Therefore, as currently claimed, the issue of patentability is a question of the obviousness of using the known solar cells in the known module.

10. Regarding the rejection of claims 1-5, 7 and 8, Applicant has argued that Asano et al. does not teach a solar cell element having a substrate on the front surface side light transmitting member and the semiconductor on a side of the rear side (see page 5 of Applicant's response). As explained above, Asano et al. show both a solar cell element having a crystalline substrate positioned on either side of the cell, as represented in Figures 4 and 5, and also show a solar cell that receives light from both sides, as shown in Figure 5. Therefore, Asano et al. clearly teach that the solar cell element can be positioned in either orientation.

11. Furthermore, Applicant has argued that there is no motivation to combine the references of Hanoka et al., Yamagishi et al. and Asano et al. (see page 5 of Applicant's response). Yamagishi et al. is only used to show that the use of soda lime glass, a glass containing sodium is conventional in the art. Further proof that sodium containing glass is commonly used in the art is found in the instant disclosure, wherein the prior art solar cell was determined to degrade as a result of sodium migration from the glass (see page 4 of the instant disclosure). Therefore using sodium containing glass is conventional in the art and the use of known materials for their known purpose is not novel (see MPEP §2144.07). Regarding the combination of Hanoka et al. and Asano et al., Hanoka et al. disclose the use of crystalline silicon cells in the module.

Therefore, it would have been obvious to use the crystalline solar cell of Asano et al. in the module of Hanoka et al. because it would the combination requires using a known solar cell for its intended use in the module of Hanoka et al.

12. Regarding the rejection of claim 6, it is noted that the limitation is a product-by-process limitation, wherein the only structural limitation provided is the use of a single crystalline silicon solar cell element that is doped. Matsushita et al. disclose the use of a doped single crystalline silicon substrate that teaches all of the structural limitations provided in the instant claim. In light of the above arguments regarding the rejection of claims 1-5, 7 and 8, all of the recited elements have been satisfied by the combination of references.

Conclusion

13. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. U.S. Pat. No. 5,648,675 issued to Terada et al. discloses that heterojunction-type solar cells in which an amorphous silicon layer is stacked on a crystalline silicon substrate is known.

14. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Brian L. Mutschler whose telephone number is (703) 305-0180. The examiner can normally be reached on Monday-Friday from 8:00am to 4:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam Nguyen can be reached on (703) 308-3322. The fax phone numbers

for the organization where this application or proceeding is assigned are (703) 872-9310 for regular communications and (703) 872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

blm
February 13, 2003

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